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# *PM130 Series* TRUEMETER™ The Low Cost Analog Replacement

The PM130 TrueMeter™ Powermeters are a cost effective means of replacing numerous single function analog meters such as voltage, current, frequency, etc., with an "all measurements in one" digital design, reducing meter, switch, wiring, termination, and signal conditioning costs.

Model PM130 Replaces up to 14 Analog Meters ■ Model PM130P Replaces up to 42 Analog Meters (28 additional meters to the PM130) ■ Model PM130E Replaces up to 56 Analog Meters (14 additional to the PM130P):

- ◷◷◷ Voltmeters
- ◷◷◷ Ammeters
- ◷ Neutral Current
- ◷ Frequency
- ◷◷◷ Min/Max Volts
- ◷◷◷ Max. Amp Demand
- ◷ Total Watts
- ◷◷◷ Watts
- ◷ Total vars
- ◷◷◷ vars
- ◷ Total VA
- ◷◷◷ VA
- ◷ Total PF
- ◷◷◷ PF
- ◷◷◷ Min/Max Amps
- ◷ Min/Max Neutral
- ◷ Min/Max Frequency
- ◷ Min/Max PF
- ◷ Min/Max kW
- ◷ Min/Max kvar
- ◷ Min/Max kVA
- ◷◷◷ Max. Volts Demand
- ◷ Total MWh (Imp/Exp)
- ◷ Total Mvarh (Imp/Exp)
- ◷ Total MVAh
- ◷◷◷ Phase MWh
- ◷◷◷ Phase Mvarh
- ◷◷◷ Phase MVAh
- ◷ Max kW Demand
- ◷ Max kVA Demand

| MEASURED PARAMETERS | | | Display | | | Comm. | Options | Relay | |
|---|---|---|---|---|---|---|---|---|---|
| | | | PM130 | PM130P | PM130E | | | | |
| True RMS Voltage (Volts L-N and L-L) | | Average RMS per phase | • | • | • | PM130 P,E | • | - | |
| *Direct Voltage Input* | *Up to 690 V L-L and 400V L-N* | Real-time per phase | - | - | - | PM130 P,E | • | - | |
| *PT ratio* | *1 to 6,000 .0* | Min/Max per phase | • | • | • | PM130 P,E | - | - | |
| *Range of Reading:* | *1-999 000 V* | Voltage Unbalance | - | • | • | P,E | - | - | |
| *Accuracy* | *±0.2% FS (10% to 120% FS)* | | | | | | | | |
| True RMS Current (Amps) | | Average RMS per phase | • | • | • | PM130 P,E | • | - | |
| *Secondary Current Input* | *5A or 1A* | Real-time per phase | - | - | • | PM130 P,E | • | - | |
| *CT ratio* | *1 to 60,000* | Min/Max per phase | - | • | • | P,E | - | - | |
| *Range of Reading* | *0-60,000 A* | Current Unbalance | - | • | • | P,E | - | - | |
| *Accuracy* | *±0.2% FS (2% to 150% FS)* | | | | | | | | |
| Neutral Current (Amps) | | Average RMS current | • | • | • | PM130 P,E | • | - | |
| *Range of Reading* | *0-60,000 A* | Real-time | - | • | • | PM130 P,E | • | - | |
| *Accuracy* | *±0.5% FS (2% to 150% FS)* | Min/Max | - | • | • | P,E | - | - | |
| Frequency (Hz) | | Average | • | • | • | PM130 P,E | • | - | |
| *Range of Reading* | *45.00-65.00 Hz* | Real-time | - | - | • | PM130 P,E | • | - | |
| *Accuracy* | *±0.1% Reading* | Min/Max | - | • | • | P,E | - | - | |
| Power Factor (PF) | | Average total | - | • | • | P,E | - | - | |
| *Range of Reading* | *0.0-1.000 Lag/Lead* | Average per phase | - | • | • | P,E | - | - | |
| *Accuracy* | *±0.1% Reading (PF=1..0.5)* | Real-time total & per-phase | - | • | • | P,E | - | - | |
| | | Min/Max total | - | • | • | P,E | - | - | |
| *Phase Rotation* | *Positive, Negative, Error* | Pos, Neg, Err | • | • | • | • | | | |
| ***POWER FUNCTIONS*** | | | | | | | | | |
| Active Power (Watts) | | Average total | - | • | • | P,E | • | - | |
| *Range of Reading* | *-3,000,000 to 3,000,000* | Average per phase | - | • | • | P,E | - | - | |
| *Accuracy* | *±0.5% FS, (PF=1..0.5)* | Real-time total & per-phase | - | - | • | P,E | - | - | |
| | | Min/Max total | - | • | • | P,E | - | - | |
| Reactive Power (vars) | | Average total | - | • | • | P,E | • | - | |
| *Range of Reading* | *-3,000,000 to 3,000,000* | Average per phase | - | • | • | P,E | - | - | |
| *Accuracy* | *±0.5% FS, (PF=1..0.5)* | Real-time & per-phase | - | - | • | P,E | - | - | |
| | | Min/Max total | - | • | • | P,E | - | - | |
| Apparent Power (VA) | | Average total | - | • | • | P,E | • | - | |
| *Range of Reading* | *0 to 3,000,000 kVA* | Average per phase | - | • | • | P,E | - | - | |
| *Accuracy* | *±0.5% FS, (PF=1..0.5)* | Real-time & per-phase | - | - | • | P,E | - | - | |
| | | Min/Max total | - | • | • | P,E | - | - | |
| ***ENERGY FUNCTIONS*** | | | | | | | | | |
| Active Energy (MWh) | | Total (forward & Export) | - | - | • | E | - | • | |
| *Range of Reading* | *0 to 99,999 MWh* | output per phase | - | - | • | E | - | - | |
| *Accuracy* | *As Power* | | | | | | | | |
| Reactive Energy (Mvarh) | | Third (reverse & Export) | - | - | • | E | - | • | |
| *Range of Reading* | *0 to 99,999 Mvarh* | Export per phase | - | - | • | E | - | - | |
| *Accuracy* | *As Power* | Total net | - | - | • | E | - | - | |
| Apparent Energy (MVAh) | | Total | - | - | • | E | - | • | |
| *Range of Reading* | *0 to 99,999 MVAh* | Per phase | - | - | • | E | - | - | |
| *Accuracy* | *As Power* | | | | | | | | |
| ***DEMAND FUNCTIONS*** | | | | | | | | | |
| Voltage Demand (Volts) | | Demand per phase | - | • | • | P,E | • | - | |
| *(same as voltage)* | | Max Demand per phase | - | • | • | P,E | • | - | |
| Amps Demand (Amps) | | Demand per phase | - | - | - | PM130 P,E | • | - | |
| *(same as current)* | | Max Demand per phase | • | • | • | PM130 P,E | • | - | |
| | | Demand | - | - | • | E | - | - | |
| Active Power Demand (Watts) | | Maximum Demand | - | - | • | E | - | - | |
| *(same as Active Power)* | | Accumulated Demand | - | - | • | E | • | - | |
| | | Sliding Demand | - | - | • | E | • | - | |
| | | Predicted Demand | - | - | • | E | • | - | |
| | | Demand | - | - | • | E | • | - | |
| Apparent Power Demand (VA) | | Maximum Demand | - | - | • | E | • | - | |
| *(same as Apparent Power)* | | Accumulated Demand | - | - | • | E | • | - | |
| | | Sliding Demand | - | - | • | E | • | - | |
| | | Predicted Demand | - | - | • | E | • | - | |

## INPUT SPECIFICATIONS

**Voltage:**
- Direct Voltage Input: Up to 690V L-L and 400V L-N
- PT ratio: 1.0-6500
- Range of Reading: 1-999.000V
- Burden: Directly < 0.5VA, Via PT < 0.15VA

**Current:**
- Secondary Current Input: 5A or 1A
- Range of Reading: 0-60,000A
- Burden: 2.5 to 4mm2 wire from CT
- Overload: 5A CT = 15A RMS continuous, 250A for 1 sec. 1A CT = 3A RMS continuous, 50A for 1 sec.

**Power Supply:**
Galvanically isolated, 90-144V AC or 185-264V AC (factory set), 50/60 hz. 5 VA burden

## OUTPUT SPECIFICATIONS

**Programmable Relay Output (option):**
Relay can be assigned to trigger on programmable set-point actions or provide energy pulses (PM130E) proportional to measured kWh or kvarh, with a selectable rate per pulse. Relay rated at 3A, 250V AC / 3A, 30V DC or 0.25A 125V DC (Resistive load - SPST Form A)

**Communication:**
Optically isolated RS-485 via removable service strip. Max. wire diameter 12 AWG (2.0mm)
Baud rate selectable to 19,200kbs. 7 or 8 bit even parity or 8 bit no parity. Up to 100 address points in ASCII, 247 address points in MODBUS, and 256 address points in DNP allow multiple powermeters to be connected to one PC in multi-drop mode. Communication via modem is also available. MODBUS and ASCII or DNP3.0 and ASCII protocols are available.

## MISCELLANEOUS

**Voltage Input Terminals:**
UL Recognized E129258. Max wire section 10 AWG (4 mm²)

**Current Inputs:**
Galvanically isolated CT core accepts pass through of wire sized to 0.3 inch (7.5 mm) total thickness diameter

**Power Supply Terminals:**
Terminal Block. Max wire section 14 AWG (1.6 mm²)

**Relay Terminals (option):**
Terminal Block. Max wire section 14 AWG (1.6 mm²)

**Environmental:**
Operating temperature: -20° to +60° C (-4° to +140° F)
Storage temperature: -25° to +60° C (-13° to +176° F)
Humidity: 0-95% non-condensing

**Dimensions (mounted):**
4.8x4.8x4.26 inch (114.3 x 114.3 x 109 mm)

**Mounting:**
Panel mounted 4-inch round cut out or 92x92mm square DIN

**Case Enclosure:**
Molded plastic case - flame resistant ABS & Polycarbonate Blend

**Weight:**
1.54 lb (0.70 kg)

**Warranty:**
3 Year limited warranty

**Standards:**
- UL: Recognized - E129258 (US & Canada)
- CE: EMC: 89/336/EEC as amended by 92/31/EEC and 93/68/EEC
  LVD: 73/23/EEC as amended by 93/68/EEC and 93/465/EEC
  Harmonized Standards to which Conformity is Declared: EN 55011:1991; EN 50082-1:1992 EN 61010-1:1993; A2/1995
  Immunity Standards
- IEC: IEC 1000-4-2 Electrostatic Discharge
  IEC 1000-4-3 Radio Frequency Interference (RFI)
  IEC 1000-4-4 Electrical Fast Transient (EFT)
- ANSI C37.90.1 Surge Withstand Compatibility (SWC)
  Oscillatory 2.5kV/1 MHz
  Fast Transient 5kV/150 ns.
- ANSI C62.41-1991 Standard Surge

ISO 9002
Year 2000 Compliant (Y2K)

SATEC *Powerful Solutions*

## ORDERING INFORMATION

PM130 PM130P PM130E

**PM130 (Volt, Amp, Frequency)**
Voltage, Current, Neutral Current, Frequency, Min/Max Volts, Max Amp Demand, Phase Rotation

**PM130P (Power Version)**
Adds to PM130 - Watts, Vars, VA, PF, Min/Max values (Volts Amps, Neutral, Hz, PF, kW, kvar, kVA), Max Amp Demand, Max Volt Demand, Voltage Unbalance, Current Unbalance

**PM130E (Energy Version)**
Adds to PM130P - MWh (Imp/Exp), Mvarh (Imp/Exp), MVAh, Per Phase Energy, Max kW Demand, Max kVA Demand

**PM130 SERIES TRUEMETER™**

PM130-
PM130P-
PM130E-

OPTIONS

VOLTAGE INPUTS
- 0 690V AC Nominal Voltage Input
- U 120V AC Nominal Voltage Input

CURRENT INPUTS
- 5 5 Ampere
- 1 1 Ampere

POWER SUPPLY
- 1AC 90-144V AC
- 2AC 185-264V AC

COMMUNICATION PROTOCOLS
- 00 MODBUS & ASCII
- 1P DNP3.0 & ASCII

RELAY CONTACT OPTION
- 00 No Relay Output
- Z1 Programmable Relay Output

EXAMPLE:
PM130P-0-5-1AC-00-00 or PM130P-5-1AC


**SATEC, Inc.**
One Springfield Ave., Summit, NJ 07901
Tel: (908) 608-0500 Fax (908) 608-0535
E-mail: satec@oksatec.com
www.oksatec.com

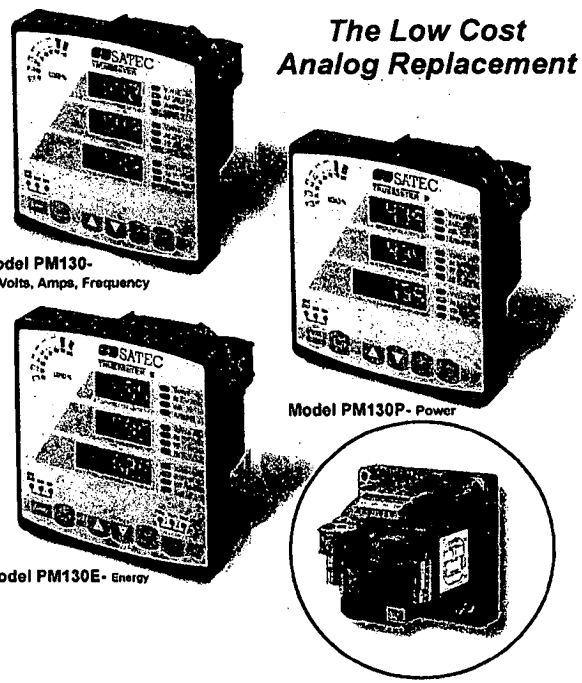


800078
REV.A1


58130-0099A

# *PM130 Series* TRUEMETER™

## *The Low Cost Analog Replacement*



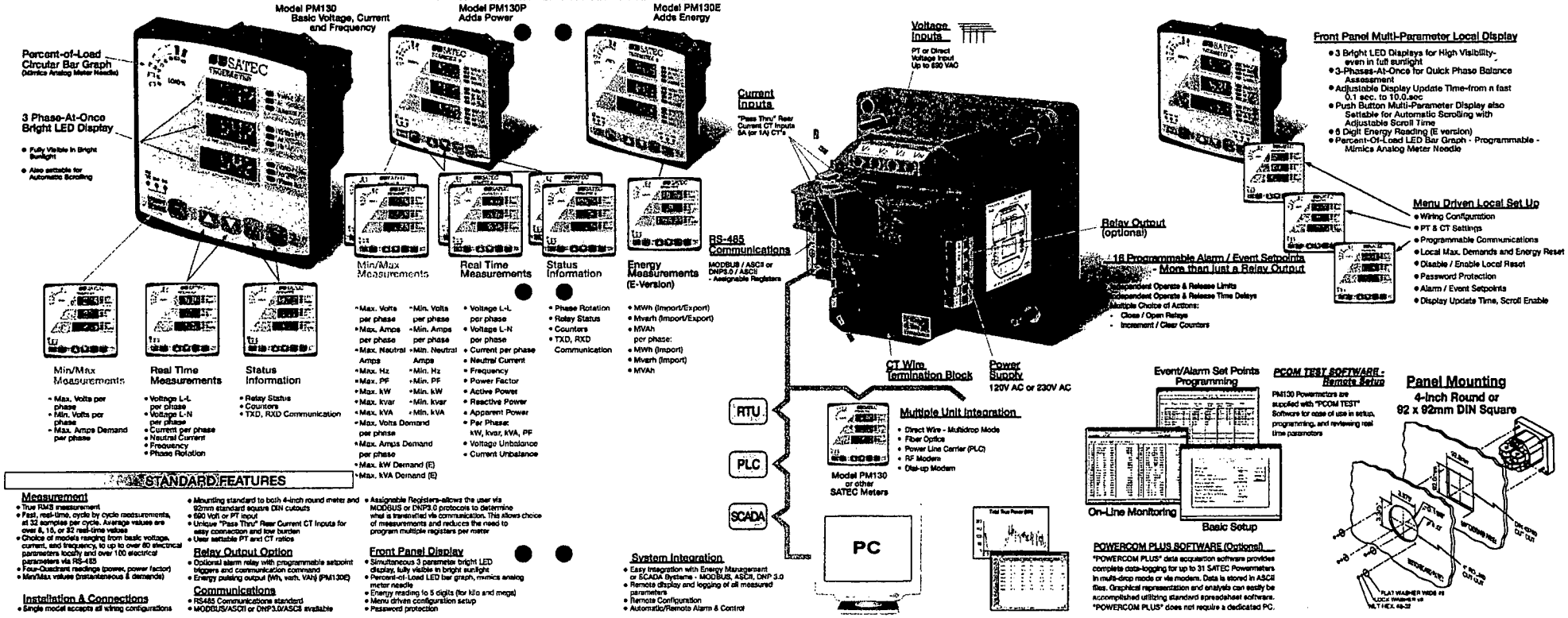
**Model PM130-**
Volts, Amps, Frequency

**Model PM130P-** Power

**Model PM130E-** Energy

SATEC *Powerful Solutions*

# CHOICE OF TRUEMETER™ MODELS >>>>> BUILT IN COMMUNICATIONS >>>> LOCAL DISPLAY AND PROGRAMMING




## STANDARD FEATURES

### Measurement
- True RMS measurement
- Fast, real-time, cycle by cycle measurements, at 32 samples per cycle. Average values are over 8, 16, or 32 real-time values
- Choice of models ranging from basic voltage, current, and frequency, to up to over 80 electrical parameters locally and over 100 electrical parameters via RS-485
- Four-Quadrant readings (power, power factor)
- Min/Max values (instantaneous & demands)

### Installation & Connections
- Single model accepts all wiring configurations
- Mounting standard to both 4-inch round meter and 92mm standard square DIN cutouts
- 690 Volt or PT input
- Unique "Pass Thru" Rear Current CT Inputs for easy connection and low burden
- User settable PT and CT ratios

### Relay Output Option
- Optional alarm relay with programmable setpoint triggers and communication command
- Energy pulsing output (Wh, varh, VAh) (PM130E)

### Communications
- RS485 Communications standard
- MODBUS/ASCII or DNP3.0/ASCII available
- Assignable Registers-allows the user via MODBUS or DNP3.0 protocols to determine what is transmitted via communication. This allows choice of measurements and reduces the need to program multiple registers per meter

### Front Panel Display
- Simultaneous 3 parameter bright LED display, fully visible in bright sunlight
- Percent-of-Load LED bar graph, mimics analog meter needle
- Energy reading to 5 digits (for kilo and mega)
- Menu driven configuration setup
- Password protection

ION TECHNOLOGY

# 6200 ION

## Installation & Basic Setup Instructions

POWER MEASUREMENT

# Notices

## Danger

During normal operation of this device, hazardous voltages are present which can cause severe injury or death. These voltages are present on the terminal strips of the device and throughout the connected potential transformer (PT), current transformer (CT), status input, relay, and control power circuits. Installation and servicing should be performed only by qualified, properly trained personnel.

## Warning

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the *Installation and Basic Setup Instructions*, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area may cause interference in which case the operator will be required to take whatever measures may be required to correct the interference.

## Limitation of Liability

Power Measurement Limited reserves the right to make changes in the devices or the device specifications identified in this *Installation & Basic Setup Instructions* without notice. Power Measurement Limited advises customers to obtain the latest version of device specifications before placing orders to verify that the information being relied upon by the customer is current.

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Covered by the following patents: US Patents 6000034, 6185508 and 5828576. Other patents pending.

# Installation Considerations

Installation and maintenance of the 6200 ION meter should only be performed by qualified, competent personnel that have appropriate training and experience with high voltage and current devices. Every effort has been made to ensure the installation instructions presented in this document are clear and easy to understand; however, if you are not sure how to perform any of the instructions provided, DO NOT CONTINUE THE INSTALLATION. The 6200 ION meter must be installed in accordance with all Local and National Electrical Codes.

**WARNING**: Failure to observe the following information may result in severe injury or death.

- During normal operation of this device, hazardous voltages are present on the terminal strips of the device and throughout the connected potential transformer (PT), current transformer (CT), control power and external I/O circuits. PT and CT secondary circuits are capable of generating lethal voltages and currents with their primary circuit energized. Follow standard safety precautions while performing any installation or service work (i.e. removing PT fuses, shorting CT secondaries, etc).
- The terminal strips on the meter base should not be user-accessible after installation.
- Do not use digital output devices for primary protection functions. These include applications where the device performs energy limiting functions or provides protection of people from injury. If failure of the device can cause injury or death, or cause sufficient energy to be released that a fire is likely, do not use the 6200 ION meter. The 6200 ION meter can be used for secondary protection functions.
- Do not HIPOT/Dielectric test the digital inputs/outputs, or communications terminals. Refer to the label on the device for the maximum voltage level the device can withstand.
- Terminal strip torque:

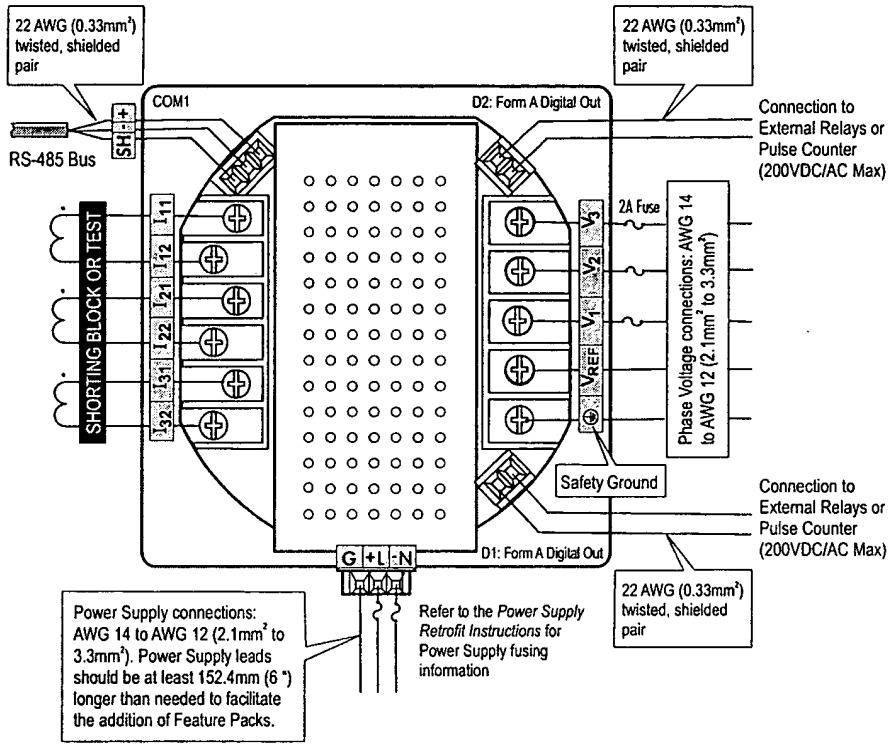
  Current, voltage, and safety ground terminals: 1.35Nm or 1.0 ft • Lbf torque (max).
  Digital inputs/outputs, communications, and power supply: 0.90Nm or 0.7 ft • Lbf torque (max).

**CAUTION**: Failure to observe the following may result in permanent damage to the device.

- The 6200 ION meter offers a range of hardware options that affect input ratings. Applying current levels incompatible with the current inputs will permanently damage the 6200 ION meter. This document provides detailed installation instructions applicable to each hardware option.
- The 6200 ION meter safety ground must be properly connected to the switchgear earth ground for the noise and surge protection circuitry to function correctly. Failure to do so will void the warranty.
- When the integrated display unit or the RMD unit is mounted flush to a panel with the supplied gasket, then the front side meets NEMA type 4, 4x and 5 (according to NEMA standards 1-10-1979 and 5-25-1988) and meets IP 543.

# Table of Contents

# Installation Overview




1. Insert the Options Card in the slot at the back of the meter (refer to the diagram "Plug-in Modules" on page 8, and the *6200 ION Options Card Retrofit Instructions*).
2. Mount the meter.

   Integrated model:

   - Cut a hole in the mounting surface to DIN 96 or ANSI 4" specifications (refer to "Mounting the Integrated Model" on page 10).
   - Install the meter in the hole (refer to "Mounting the Integrated Model" on page 10).

   TRAN model:

   - Mount the meter flush against a flat surface with screws, or snap into a standard DIN rail (refer to "Mounting the TRAN Model" on page 11).

3. Mount the Remote Modular Display (RMD) against a flat surface with the supplied screws, if your meter ordering option includes an RMD (refer to the *6200 ION RMD Retrofit Instructions).*
4. Attach the Feature Pack™ to the meter, if your meter ordering option includes a Feature Pack (refer to the *6200 ION Feature Pack Retrofit Instructions*).
5. Attach the power supply to the meter, or attach it to the Feature Pack installed in the previous step (refer to "Plugging in the Power Supply" in the *6200 ION Power Supply Retrofit Instructions*).
6. Connect the RMD to the TRAN meter, if your meter ordering option includes a TRAN meter and an RMD (refer to the *6200 ION RMD Retrofit Instructions).*
7. Wire the ⏚ (safety ground) terminal to earth ground (refer to "Connecting the Base Unit Safety Ground" on page 14).
8. Wire the power supply (refer to "Connecting the Power Supply" on page 14, or the *6200 ION Power Supply Retrofit Instructions* for more details). Do not power up the power supply until the rest of the meter wiring is complete.
9. Wire the voltage and current inputs (refer to "Connecting the Phase Voltage Inputs" on page 15, and "Connecting the Phase Current Inputs" on page 16).
10. Wire the digital outputs, if your meter ordering option includes digital outputs (refer to "Digital Outputs Connection" on page 21).
11. Wire the communications, if your meter ordering option includes communications (refer to "RS-485 Communications Connections" on page 22).
12. Close the PT fuses (or direct voltage input fuses), and open the CT shorting blocks.
13. Apply power to the meter.
14. Configure the meter (refer to "Basic Setup" on page 23).
15. Verify the meter operation (refer to "Verifying Meter Operation" on page 40).

# Introduction


6200 ION Meter

The 6200 ION meter is small, simple to install, and can be easily upgraded in the field. It provides revenue accurate measurements, has a large bright display, and is versatile.

The meter's modular design allows you to "plug in" components to expand your metering capabilities as your power system requires. Plug in an enhanced Options Card for a broader range of power measurements, or plug in a Feature Pack for extended capabilities.

### Integrated and TRAN Models

The 6200 ION meter is available as an Integrated (display) or TRAN (transducer) model. The Integrated model has a large, bright front panel display. The TRAN model has no display; it can be connected to a Remote Modular Display unit (RMD) to provide a display identical to that on the Integrated model. Installation for the Integrated and TRAN models is covered in this guide. Refer to the *6200 ION RMD Retrofit Instructions* regarding the RMD.

**NOTE:** In the 6200 ION meter documentation, the term "basic meter" refers to the Integrated or TRAN models with an Options Card that provides standard measurements (voltage and current), and without a Feature Pack.

### Options Card

The basic meter has an Options Card that enables standard measurements: voltage and current. You can also order an Options Card that enables extended capabilities: RS-485 communications, two digital pulse outputs, and additional measurements (Enhanced Measurement Packages 1 and 2). Refer to the Options Card features tables on page 45 and page 46, or the *6200 ION Options Card Retrofit Instructions*.

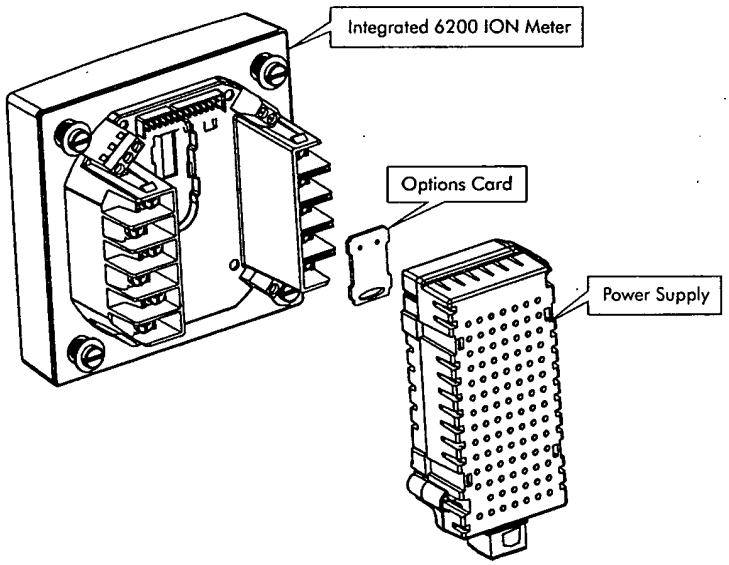
### Future Feature Packs

Feature Packs[1] provide advanced capabilities for the meter including digital and analog I/O, communications protocols, and power quality measurements. Refer to the *6200 ION Feature Packs Retrofit Instructions*.

### Power Supply

The power supply is also a plug-in component that is easy to install. Refer to the *6200 ION Power Supply Retrofit Instructions*.

**Plug-in Modules**




[1] Feature Packs are in development and will be available in the future. In the diagram above, Feature Packs are not shown. The Feature Pack(s) will install between the meter and the power supply.

# Location & Mounting

Mount the meter in a dry location free from dirt and corrosive vapors. Once installed, no cleaning of the device is necessary.

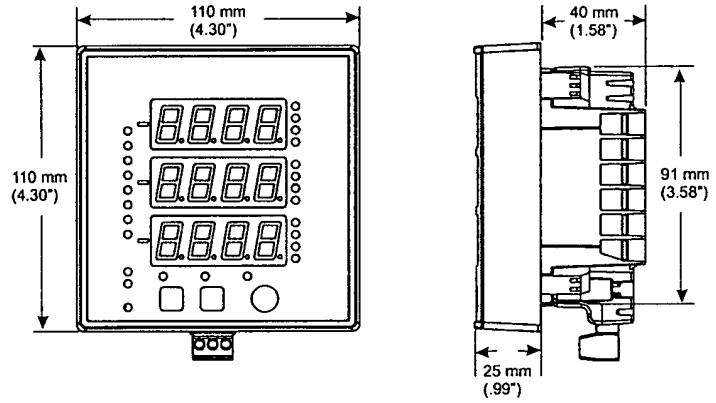
### Environmental Specifications

Refer to the Environmental specifications on page 43.

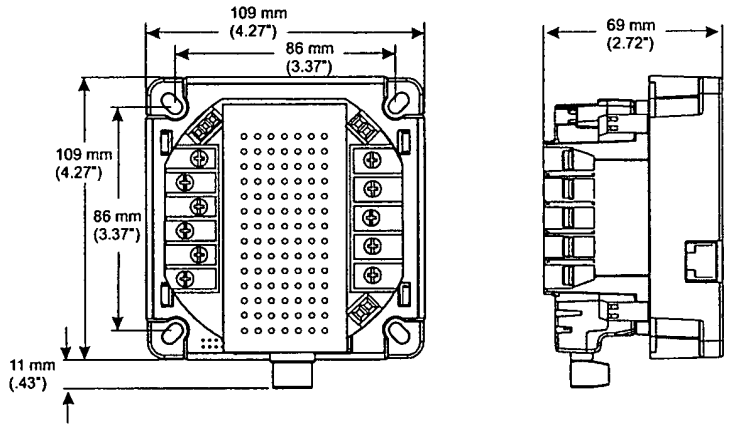
## Unit Dimensions

The meter and meter options dimensions are shown below.

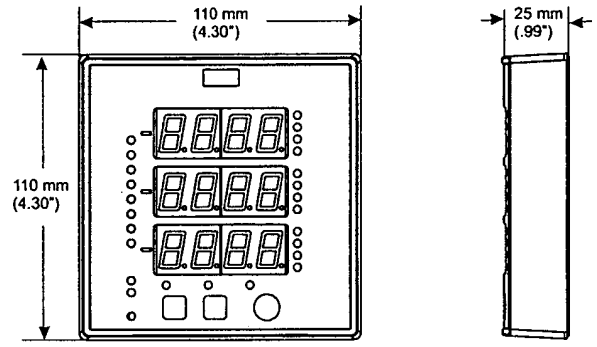
### Integrated Model Dimensions




### TRAN Model Dimensions



### RMD Dimensions



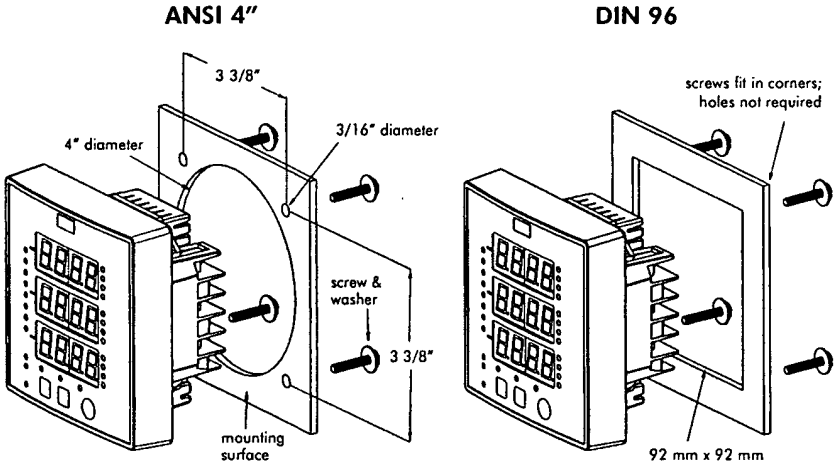

## Mounting the Meter

The basic meter (with an integrated display) fits in a DIN standard 92 X 92 mm (3.6" X 3.6") panel cutout, as well as a standard ANSI 4" panel cutout (commonly referred to as a 4 1/2" Switchboard cutout). Standard panel punches are available for retrofit applications.

> ⚠ **CAUTION**: Include a switch or circuit breaker in each installation, in close proximity to the unit and within easy reach to the operator. Mark this switch (or circuit breaker) as the disconnecting device for the unit.

### Mounting the Integrated Model

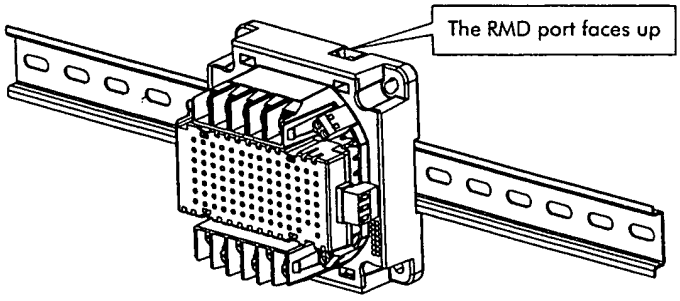
1. Fit the meter into the cutout.
2. Slip the washers on the screws and insert each screw in the corresponding drilled hole on the mounting surface (no drilled holes required in a DIN 96 cutout).
3. Place each screw in its corresponding metal insert located on one of the back corners of the meter.
4. With a #2 Phillips screwdriver, tighten the screws to 1.35Nm or 1 ft • Lbf (maximum).




## Mounting the TRAN Model

The TRAN meter is the basic meter with no display. The TRAN can be mounted flush against any flat surface in any orientation with four #8 or #10 size screws (1.35Nm or 1 ft • Lbf maximum). The meter casing provides four slots (in the ANSI 4" bolt pattern) on its mounting flanges for this purpose. The TRAN is typically mounted inside the switchgear cabinet.

The TRAN can be easily snapped in place on a standard DIN rail, European Standard EN50022:1977. The recommended orientation is with the RMD port upwards, as shown in the diagram below. In this orientation, the sliding snap feature has the most strength.



### Mounting the RMD

The Remote Modular Display (RMD) is supplied separately as an addition to an existing TRAN meter. The RMD can be mounted in either a standard DIN or ANSI cutout (refer to the diagram in "Mounting the Integrated Model"). With only 5 small holes, the RMD can also be mounted on a flat panel. See the *6200 ION RMD Retrofit Instructions*.

# Field Wiring Connections

**DANGER**: Be familiar with the warnings presented at the beginning of this document before proceeding with the installation of the meter.

## Field Service Considerations

If the meter requires servicing or field upgrading, you may need to disconnect and remove the meter from its mounting. The initial installation should be done in a way that makes this as convenient as possible:

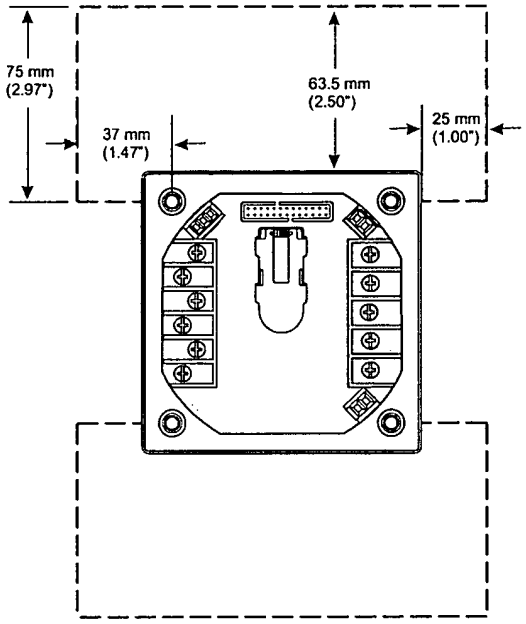
- All phase voltage sense leads should be protected by breakers or fuses at their source so the meter can be safely disconnected.
- A CT shorting block should be provided so that the meter current inputs can be safely disconnected without open circuiting the CTs. The shorting block should be wired so that protective relaying is not affected.
- All wiring should be routed to allow easy removal of the connections to the meter terminal strips and the meter itself.

### Feature Pack Requirements*

Feature Packs install between the basic meter and the power supply, and may protrude beyond the meter top and bottom (refer to the following diagram). Note that the power supply rotates 180 degrees. As a result, these requirements should be considered:

- Power supply leads should be at least 152.4 mm (6") longer than needed to facilitate the addition of Feature Packs.
- A minimum of 63.5 mm (2.5") above and below the meter should be left free from cables, wiring, and other devices.
- With a Feature Pack installed, the meter has a maximum depth of 63.5 mm (2.5") behind the panel.

**Feature Pack Space Allowances**




* This is subject to change without notice.

## Terminal Strips

All connections to the meter are made to terminal strips at the back of the unit. The terminal strips for phase voltage and current are barrier-type, for which ring or spade terminals, or bare wire, may be used.

The terminal strips for the digital outputs, the communications port, and the supply power inputs are all captured-wire type; they accept stripped wire ends.

### Terminal Strip Covers

Terminal strip covers are provided for the voltage and current terminal strips. These covers easily snap on and off of the meter with a flathead screwdriver.

## Connecting the Base Unit Safety Ground

The ⏚ terminal of the meter provides the safety ground connection. This terminal must be connected to earth ground. A good, low impedance safety ground connection is essential for the meter surge and transient protection circuitry to function effectively. It should be made to the switchgear earth ground using a dedicated AWG 14 (2.1 $mm^2$) or larger wire to a point where there will be no voltage error due to distribution voltage drops.

The power supply G (ground) terminal should be connected to the same point as the meter ⏚ terminal.

Do not rely on metal door hinges as a ground path. Ensure that the ⏚ terminal is tightened securely to the ground wire.

> ⚠ **CAUTION**:Failur e to properly connect the meter safety ground will void the warranty.

## Connecting the Power Supply

> **NOTE**:Dis connect the power source before removing the power supply.

The meter requires a constant power supply to maintain monitoring, analysis, control, and communications operations. Powering the meter from the voltage source it is monitoring is not suitable for applications where these operations must be maintained in the event of a power outage.

If an AC power supply is being used, connect the line supply wire to the L+ terminal and the neutral supply wire to the N- terminal. If a DC power supply is being used, connect the positive supply wire to the L+ terminal and the negative supply wire to the N- terminal.

### Power Supply Specifications

Refer to the Power Supply specifications on page 44, or the *6200 ION Power Supply Retrofit Instructions*.

### Protective Fuses

The meter power supply may need to be externally fused. Refer to the *6200 ION Power Supply Retrofit Instructions*.

## Connecting the Remote Modular Display

The RMD connects to the TRAN meter with a 26 gauge 6 conductor RJ11-type cable. The cable connects between the RJ11 socket on the backside of the RMD, and the RJ11 socket on the side of the TRAN. Refer to the *6200 ION RMD Retrofit Instructions* for more information.

> **CAUTION**: Only use the supplied cable to connect the RMD.

## Connecting the Phase Voltage Inputs

Phasing and polarity of the AC voltage inputs and their relationship is critical to the correct operation of the meter. All phase voltage sense leads should be protected by breakers or fuses at their source.

### Voltage Input Specifications

Refer to the Voltage Input specifications on page 43.

> **CAUTION**: Ensure that the voltage level between $V_{REF}$ and each phase input (V1, V2 or V3) does not exceed 400 volts.

### Connection

PTs are required for all systems with voltage levels greater than those indicated in the Voltage Input specifications.

### Using Potential Transformers

Use PTs that are compliant with the electrical safety code in your region. It is recommended that PTs comply with the requirements in IEC 61010-1, Pollution Degree 2, Overvoltage Category III.

> **CAUTION**: In cases where PTs are required, the secondaries should be fused.

### V1 Input Connection

The meter uses the V1 input as the reference for frequency for all power and energy related measurements. For any system configuration, the V1 input must be connected to ensure accurate readings and correct operation of the meter. If the voltage on V1 falls below 50 V, the meter's accuracy could be affected.

### Voltage Reference (Vref) Input Connection

The meter voltage reference terminal, Vref, serves as the zero voltage reference for voltage readings. A good, low impedance Vref connection is essential for accurate measurements. It should be made using a dedicated AWG 14 to 12 wire (2.1 to 3.3 $mm^2$) to a point where there will be no voltage error due to distribution voltage drops.

## Connecting the Phase Current Inputs

AWG 14 to 12 wire (2.1 to 3.3 $mm^2$) is recommended for all current connections. Use CTs that are compliant with the electrical safety code in your region. It is recommended that CTs comply with the requirements in IEC 61010-1, Pollution Degree 2, Overvoltage Category III.

### Current Input Specifications

For Current Input specifications, refer to page 43.

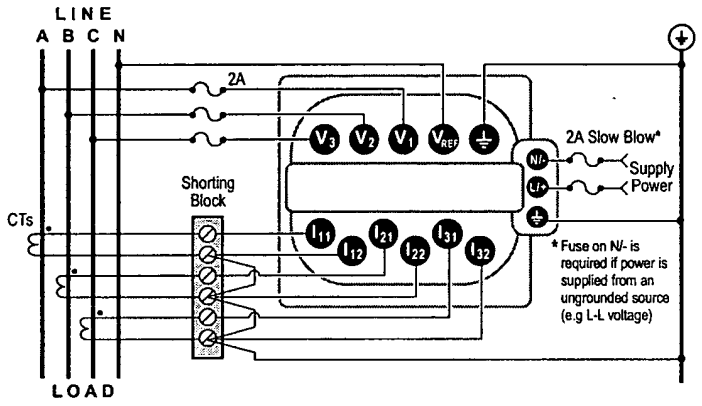
### Using Current Transformers

The CT primary rating is normally selected to be equal to the current rating of the power feed protection device. However, if the peak anticipated load is much less than the rated system capacity, you can improve accuracy and resolution by selecting a lower rated CT. In this case, the CT size should be the maximum expected peak current, rounded up to the nearest standard CT size.

The CT secondary should have a burden capacity greater than 3 VA. The length of the CT cabling should be minimized, because long cabling contributes to the burden on the CT secondary. Also, the CT burden rating must exceed the combined burden of the meter plus cabling plus any other connected devices (burden is the amount of load being fed by the CT, measured in Volt-Amps).

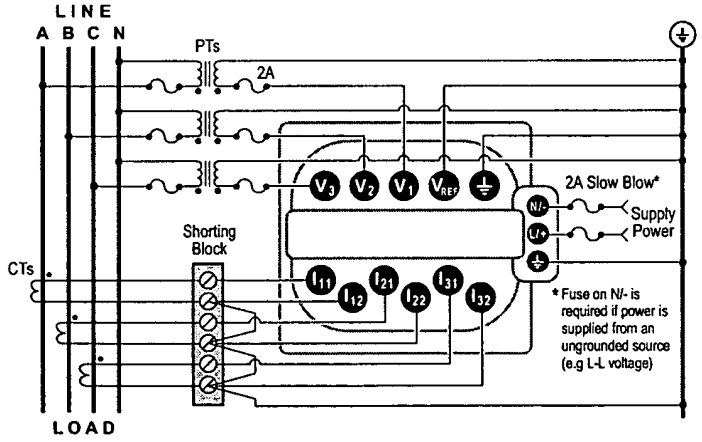
## 4-Wire Wye, 3-Element Direct Connection

**NOTE:** The meter senses the line-to-neutral voltage and current for each phase, creating an equivalent 3 element metering configuration. Volts Mode should be set to 4W-Wye.



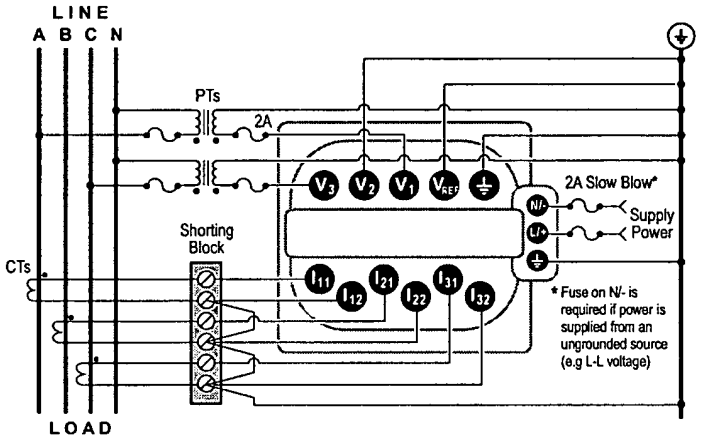

## 4-Wire Wye, 3-Element, 3 PT, 3CT

**NOTE:** Both the PT primary and secondary must be wired in a Wye (star) configuration. Wiring must be exactly as shown for correct operation. Volts Mode should be set to 4W-Wye.



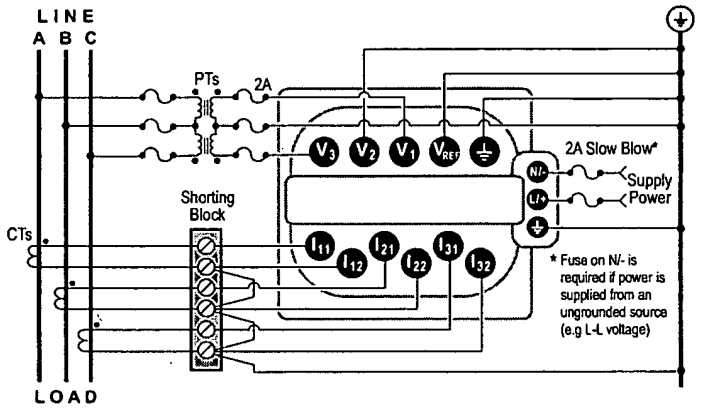
## 4-Wire Wye, 2½-Element, 2 PT, 3CT

**NOTE**: Phase B voltages are derived from the phase A and C voltages. If the voltages are unbalanced, power readings may not meet accuracy specifications. Volts Mode should be set to 3W-Wye.



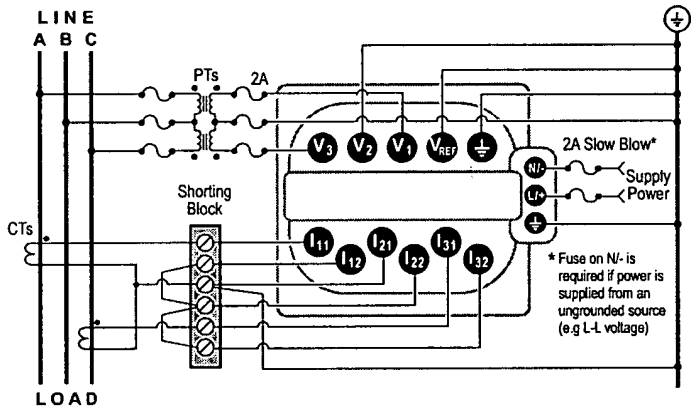

## 3-Wire Delta, 2½-Element, 2 PT, 3 CT

**NOTE**:PTs are required for ungrounded 3-wire systems above 690 Volts line-to-line. In this configuration, the meter senses the line-to-line voltages between each of the phases. Volts Mode should be set to Delta.



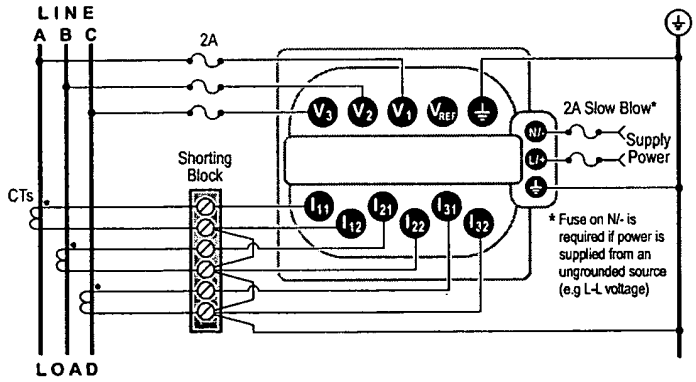
## 3-Wire Delta, 2-Element, 2 PT, 2 CT

**NOTE**:T he meter requires PTs for ungrounded 3-wire systems above 690 Volts line-to-line. Volts Mode should be set to Delta.



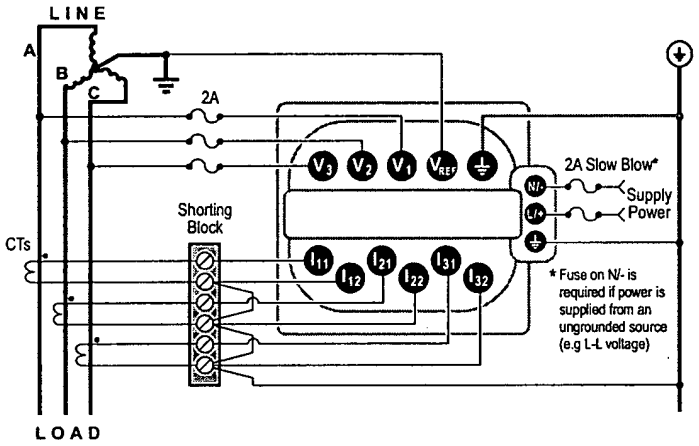

## 3 Wire Delta Direct Connection

**NOTE**:D irect Delta connections (with no PTs) are supported for power systems up to 690 Volts line-to-line. Volts Mode must be set to Direct Delta. Vref is not connected.



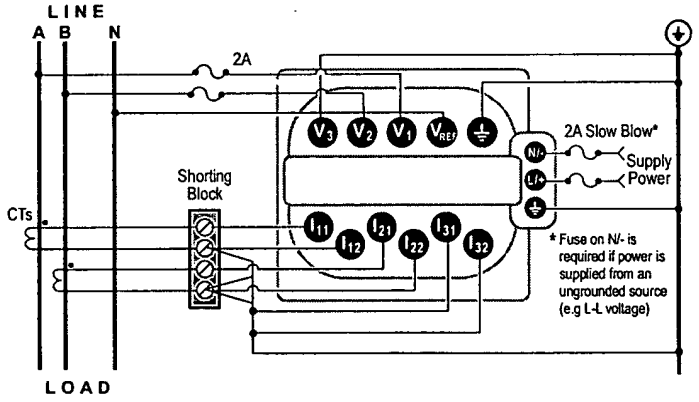
## 3-Wire Grounded Wye, 3-Element Direct

**NOTE:** The configuration requires that the transformer secondary star-point is grounded. The phase-to-ground voltages must be within the meter's range. Volts Mode should be set to 4W-Wye.




## Single Phase Connection Diagram

**NOTE:** Connect the two voltage phases (180° apart) to the V1 and V2 inputs, and the CT outputs to the I1 and I2 input pairs. Unused meter inputs are grounded. Volts Mode should be set to Single.



# Digital Outputs Connection

Digital outputs can be enabled on the meter with the appropriate Options Card. Refer to "Options Card Combinations" on page 45.

The meter provides two Form A digital relays for energy pulsing applications (kWh, kVARh, and kVAh). By default, port 1 is set to pulse kWh, and port 2 is set to pulse kVARh. The energy pulsing setup can be changed from the front panel, or with software.

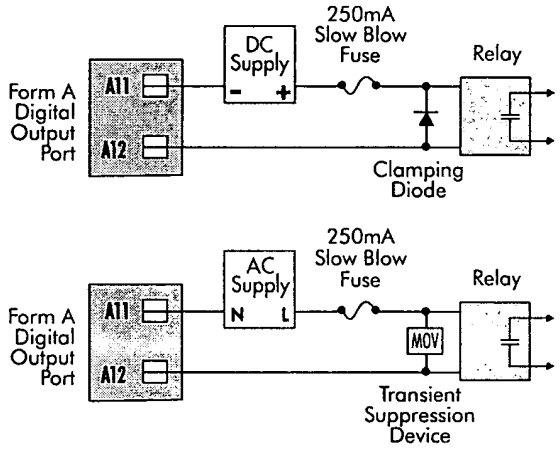
## Digital Output Specifications

For Digital Output specifications, refer to page 44.

## Form A Digital Output Connection

AWG 24 to 16 wire (0.08 $mm^2$ to 1.3 $mm^2$) is recommended for both connections. Connections to the terminal strip are shown in the diagram below.

**Typical Form A Digital Output Connections**




Select an MOV or clamping diode that ensures that the output terminals do not receive a voltage greater than 350 V peak during switching.

## Infrared (IR) Pulsing

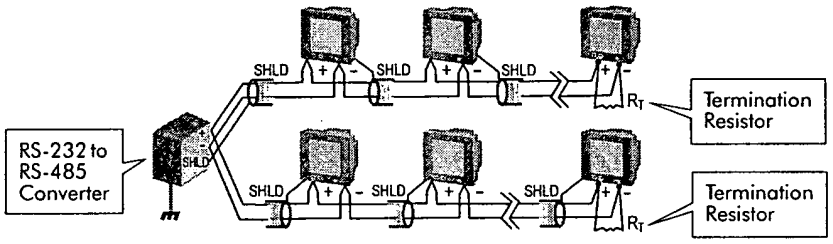
The LED near the top of the meter front panel can be configured to provide energy pulsing (kWh, kVARh, or kVAh).

# RS-485 Communications Connections

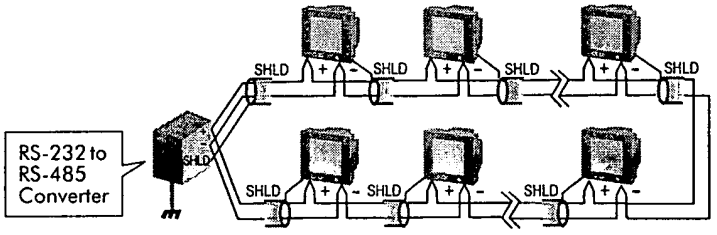
RS-485 communications can be enabled on the meter with the appropriate Options Card. Refer to "Options Card Combinations" on page 45.

RS-485 connections are made via the captured-wire connectors on the meter. Up to 32 devices can be connected on a single RS-485 bus. Use good quality shielded twisted pair RS485 cable, AWG 22 (0.33 $mm^2$) or larger. The overall length of the RS-485 cable connecting all devices cannot exceed 1219 m (4000 ft). The lengths of all (+ and –) cable segments must be counted including those that connect devices to terminal blocks.

**Straight Line Topology**




**Loop Topology**




### General Bus Wiring Considerations

Devices connected on the bus, including the meter, converter(s), and other instrumentation can be wired as a straight line or as a loop:

- The shield of each segment of the RS-485 cable must be connected to ground at *one end only.*
- Isolate cables as much as possible from sources of electrical noise.

- Install a ¼ Watt termination resistor (RT) between the (+) and (-) terminals of the device at each end point of a straight-line bus. The resistor should match the nominal impedance of the RS-485 cable (typically 120 ohms – consult the manufacturer's documentation).

> ⚠ **CAUTION:** Do not connect ground to the shield at both ends of a segment. Doing so allows ground loop currents to flow in the shield, passing noise into the communications cable.

### RS-485 Connection Methods to Avoid

Any device connection that causes a branch in the main RS-485 bus should be avoided. This includes *star* and *tee* (T) methods. These wiring methods cause signal reflections that may cause interference. **At any connection point on the RS-485 bus, no more than two cables should be connected.** This includes connection points on instruments, converters, and terminal strips.

### Dual Purpose RXD/TXD Indicator

Beside the RS-485 connector ⊕ terminal, there is a dual purpose RXD/TXD indicator that flashes red when the meter is transmitting, and green when the meter is receiving data.

### Protocol Documents

Refer to the *6200 ION/Modbus Register Map* documents for meter protocol implementation details.

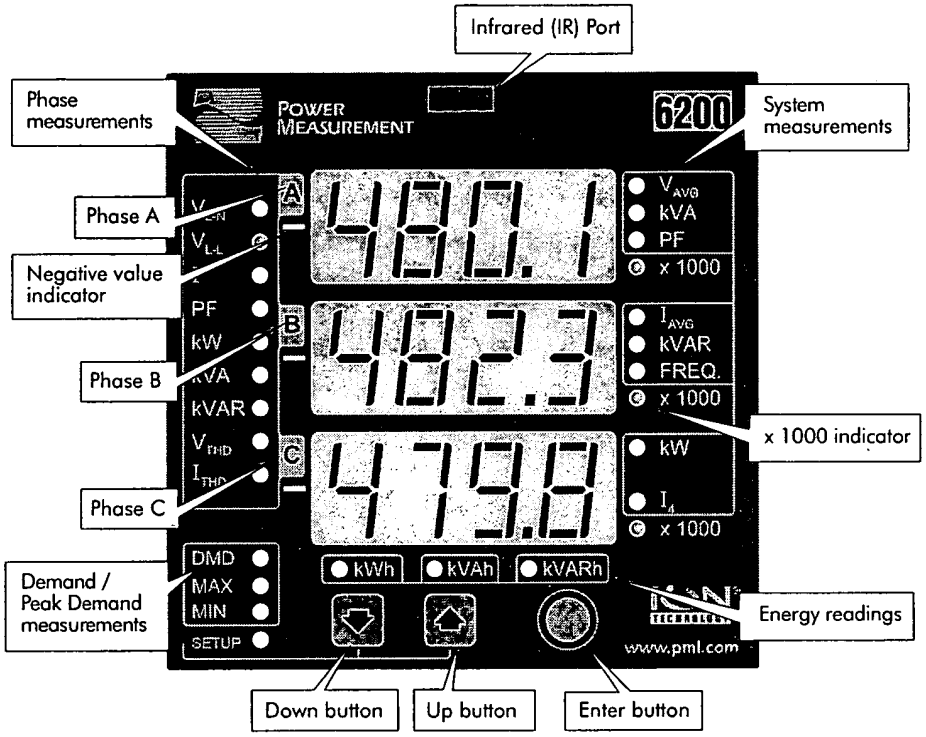
## Basic Setup

If your meter requires settings other than the factory default settings to communicate with your power-monitoring network, then you must set up the meter with the front panel or software. Basic setup determines how the meter interprets the power system it is connected to, as well as how the meter communicates with connected networks or workstations.

For parameter configuration through the front panel, the meter must be in Configuration mode. Refer to "Configuration Mode" on page 31.F or meter setting defaults and values refer to "Meter Settings" on page 47.

With PowerView Lite software, you can access the networked meter from your workstation. Refer to "System Configuration with PowerView Software" on page 37.

# Front Panel Navigation




With the meter front panel, you can view parameter values; configure parameters; perform demand resets; perform LED checks; and view meter information. Each of these functions can be accomplished by pressing the Up, Down, and Enter buttons on the front panel. These button actions achieve different results according to the mode that the meter is in:

- **Display mode** (default): view parameter measurements
- **Reset mode**: reset demand measurements
- **Configuration Select/Edit modes**: configure a parameter
- **Information mode**: verify that the front panel display LEDs operate, and view meter information, e.g, meter options, firmware version etc.

This section describes front panel navigation within each mode.

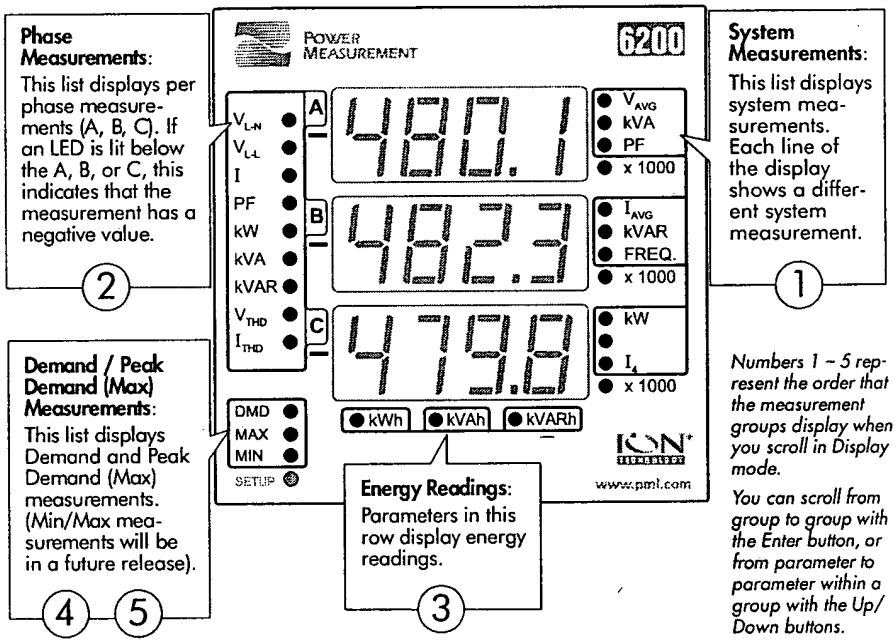
### Front Panel Button Functions

**UP/DOWN Buttons**

**ENTER Button**

For each mode, a table is included that shows how the buttons function. Three periods following a button (. . .) represent that the pressed button or button combination is held down for 2 seconds.

## Display Mode




*Numbers 1 – 5 represent the order that the measurement groups display when you scroll in Display mode.*

*You can scroll from group to group with the Enter button, or from parameter to parameter within a group with the Up/Down buttons.*

In Display mode, you can view values from these measurement groups: System (total), Per Phase, Energy, Demand, and Peak Demand. (This assumes that you have ordered Enhanced Measurement Packages 1 and 2. Refer to the "Standard Measurements and Enhanced Packages 1 – 2" on page 46, or the *Options Card Retrofit Instructions* for information regarding Options Cards).

### Display Mode Parameter Measurements

The following table lists the parameters in each measurement group:

| Measurement Group | Parameters Measured |
|---|---|
| System (Total) | $V_{AVG}$, $I_{AVG}$, kW, kVA, kVAR, PF, Frequency, I4 |
| Phase A, B, and C | $V_{LN}$, $V_{LL}$, I, PF, kW, kVA, kVAR, $V_{THD}$, $I_{THD}$ |
| Energy | kWh, kVAh, kVARh |
| Demand* | kVA, kVAR, kW, $I_{AVG}$ |
| Peak Demand (Max)* | kVA, kVAR, kW, $I_{AVG}$ |
| Min/Max | Min/Max measurements will be provided in a future release |

* Displays system (total) values.

### x 1000 Indicator

When the "x 1000" LED is lit, multiply the displayed value by 1000 for the actual value.

### Button Functions in Display Mode

The following table shows how the front panel buttons function in Display mode:

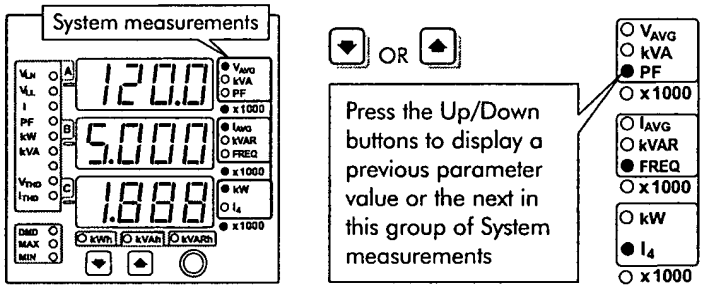
| Mode | Button | Function |
|---|---|---|
| **Display Mode**<br><br>Display mode is the meter default. |  | View the previous parameter value. |
| |  | View the next parameter value. |
| |  | Move from one measurement group to the next measurement group. |

### Viewing Parameter Measurements

The meter defaults to Display mode, and to the System measurements within this mode.

The following illustrates how to view measurements in Display mode.

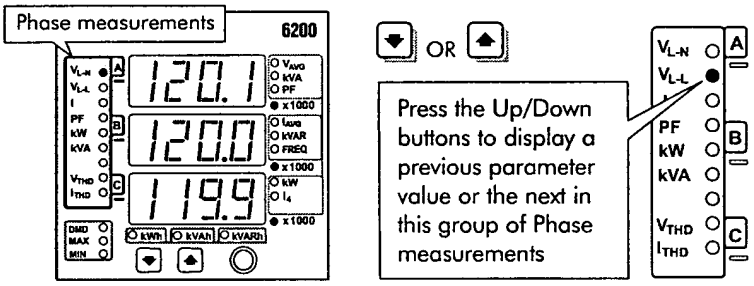
## 1. System Measurements




Each line of the display shows a System measurement. In the example above, line 1 = System Average Voltage ($V_{AVG}$) with an actual value* of 120,000; line 2 = System Average Line Current ($I_{AVG}$) with an actual value of 5,000; line 3 = System Total Active Power (kW) with an actual value of 1,888. (*Actual value = displayed x 1000.)

Press the Enter button to display **Phase** measurements.

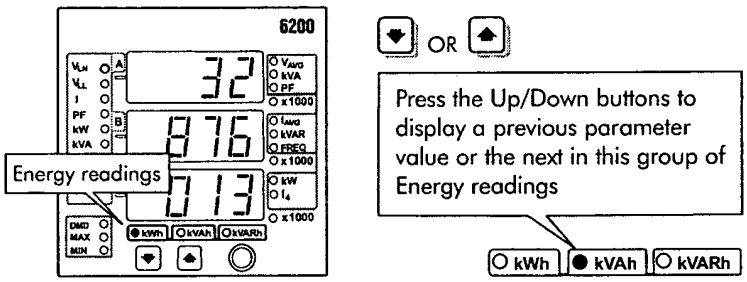
## 2. Phase Measurements




Each line of the display shows a Phase measurement. The example above shows $V_{L-N}$: Phase A, Phase B, and Phase C on lines 1, 2, and 3 respectively. If the bar-shaped LED below the A, B, or C is lit, then the phase value is negative.

Press the Enter button to display **Energy** readings.

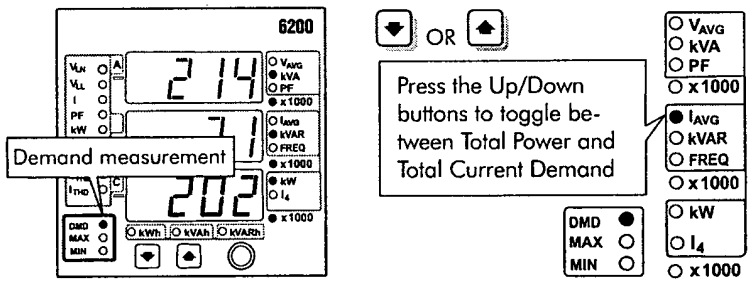
## 3. Energy Readings




An Energy reading wraps around the three lines of the front panel display. A maximum of three digits appear on each line. The most significant digit is in the left hand corner of the first display line, and the least significant digit is in the bottom right hand corner of the third display line. In the example above, the display shows 32,876,013 kWh.

Press the Enter button to display **Demand** measurements.

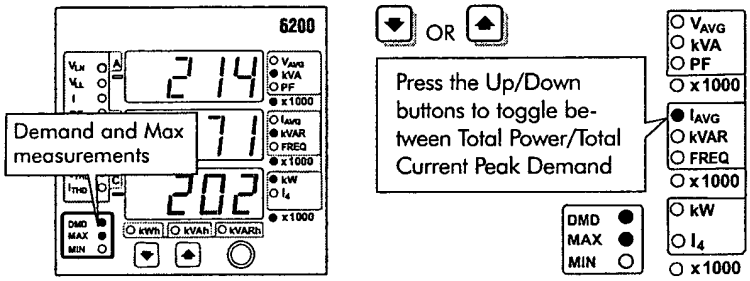
## 4. Demand Measurements




Demand measurements include Total Power Demand and Total Current Demand. The example above shows Total Power Demand for: Apparent Power (kVA); Reactive Power (kVAR) and Real Power (kW).

Press the Enter button to display **Peak Demand** measurements.

## 5. Peak Demand Measurements




Peak (Max) Demand measurements include Total Power Peak Demand, and Total Current Peak Demand. The example above shows Total Power Peak Demand for: Apparent Power (kVA); Reactive Power (kVAR) and Real Power (kW).

Press the Enter button to return to **System** measurements.

## Reset Mode

Enter Reset mode from Display mode (default) by pressing the Enter button and holding for 2 seconds. In Reset mode, you can perform a Current (Peak) Demand reset, or a Power (Peak) Demand reset, or both at the same time.

| Screen | String |
|---|---|
| Current Peak Demand Reset | Curr |
| Power Peak Demand Reset | PUdr |
| All | ALL |

## Button Functions in Reset Mode

The following table shows how the front panel buttons function in Reset mode:

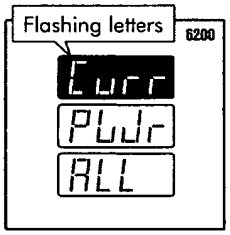
| Mode | Button | Function |
|---|---|---|
| **Reset Mode**<br><br>ENTER Reset mode by pressing the Enter button and holding for 2 seconds.<br>EXIT Reset mode with the same button sequence. | ▲ | View the previous reset parameter. |
| | ▼ | View the next reset parameter. |
| | ◎ | Program the selected (flashing) parameter reset to the meter. |

### Performing a Demand Reset

The following illustrates how to reset the Current and Power Demand measurements (reset "All").

**NOTE**:If there is no key action or input for 60 seconds during a demand reset, then the meter defaults to Display mode.

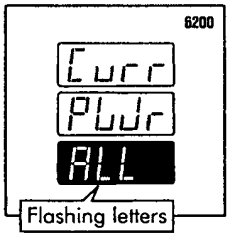
1.




◎...

**Enter Reset mode**:
Press the Enter button and hold for 2 seconds to enter Reset mode from Display mode. The Reset screen appears with the top line letters flashing.

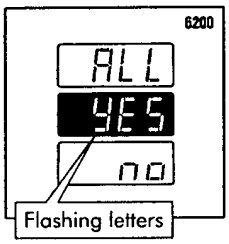
2.




▼

**Scroll down to the ALL selection**:
Use the Down button to scroll to the third line. The "All" selection flashes.

3.




**Initiate the reset:**
Press the Enter button to reset All (Current and Power Peak Demand measurements). A confirmation screen with a flashing "Yes" appears.

4.


**Confirm the reset:**
Press the Enter button to program the reset to the meter. The word "Done" appears on the second line; the third line is blank. After 1 second, the meter defaults to Display mode.

## Configuration Mode

**NOTE:** To learn about the parameters that can be configured, refer to "Meter Settings" on page 47.

Configuration mode is entered when the Up and Down buttons are pressed together and held for 2 seconds. Within Configuration mode, first use the buttons to **locate** the parameter to be edited (Configuration Select mode), then use the buttons to **edit** the displayed parameter (Configuration Edit mode).

**Configuration Select mode**: locate a displayed parameter that requires editing by pressing the Up or Down button.

**Configuration Edit mode**: edit a displayed parameter by pressing the Enter button. The parameter digit, value, or decimal point flashes (the meter automatically determines which option to flash for editing, depending on the parameter). With the Up or Down button, you can increase/decrease the digit value, move the decimal point, or select a value from a pre-programmed list. After editing, press the Enter button to set the value.

Refer to following tables to learn how the front panel buttons function in Configuration mode.

## Button Functions in Configuration Select Mode

| Mode | Button | Function |
|---|---|---|
| **Configuration Select Mode**<br>  <br>ENTER Configuration Select mode by pressing the Up and Down buttons at the same time and holding for 2 seconds.<br>EXIT Configuration Select mode with the same button sequence. |  | Move to the previous parameter configuration screen. |
| |  | Move to the next parameter configuration screen. |
| |  | Enter Configuration Edit mode so you can configure the displayed parameter value. |

## Button Functions in Configuration Edit Mode

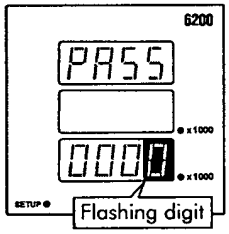
| Mode | Button | Function |
|---|---|---|
| **Configuration Edit Mode**<br>  <br>ENTER Configuration Edit mode from Configuration Select mode by pressing the Enter button.<br>EXIT Configuration Edit mode by pressing the Up and Down buttons at the same time and holding for 2 seconds.<br>  |  | **Flashing Digit**: Increase the number.<br>**Flashing Value**: View the previous list value.<br>**Flashing Decimal Point**: Move the decimal point to the right. |
| |  | **Flashing Digit**: Decrease the number.<br>**Flashing Value**: Display the next list value.<br>**Flashing Decimal Point**: Move the decimal point to the left. |
| |  <br>Press and hold for 2 seconds | **Flashing Digit**: Set the new digit value; the digit on the right flashes for editing.<br>**Flashing Decimal Point**: Set the new decimal point location; the digit on the right flashes for editing. |
| |  <br>Press and hold for 2 seconds | **Flashing Digit**: Set the new digit value; the digit on the left flashes for editing.<br>**Flashing Decimal Point**: Set the new decimal point location; digit on the left flashes for editing. |
| |  | Program the edited parameter to the meter; the meter automatically returns to Configuration Select mode. |

## Password Security

A front panel password is required for the first parameter that you configure during an editing session. Once you have entered a valid password, you can configure multiple parameters. The default password is zero.

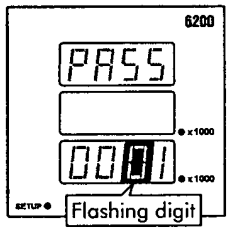
### Example: Entering a Password

In the example below, assume that we are starting an editing session, we are attempting to configure PT1, and that we have been presented with the Password screen. In this example, our password is number 61.

1. 

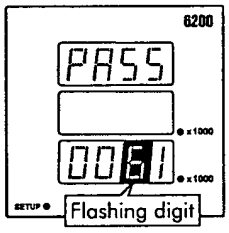

(Press once)

**Increment the digit by 1:**
Press the Up button once to change the last digit from a zero to a one.

2. 

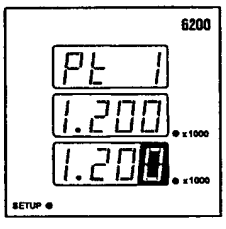

...

**Move to the next digit:**
Press the Down button and hold for 2 seconds. The digit on the left flashes for editing.

3. 


(Press six times)

**Increment the digit by 6:**
Press the Up button six times to change the digit from a zero to a six.

4. 


**Send the password to the meter:**
Press the Enter button. The password is accepted, and you are returned to the parameter you are configuring (in this example, Pt1).

**NOTE**: If you enter an incorrect password and send it to the meter, the meter returns to Configuration Select mode, NOT Configuration Edit mode. As a result, you will need to re-select the parameter for editing and re-enter the password.

## Example: Configuring PT1 (PT Primary)

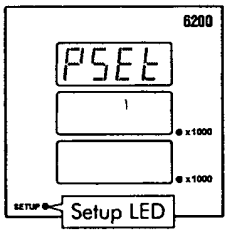
**NOTE**:If there is no key action or input for 60 seconds, then the meter defaults to Display mode.

In the example below, we will change the value of PT1 from 1,200 to 12,620. The meter displays four digits maximum, so these actual values display as 1.200 and 12.62 with the "x 1000" LED lit on the front panel.

First, we will select the parameter (PT1) to edit. Then, we will confirm the default password, change digit values, and re-locate the decimal point. Finally, we will program the new PT1 value to the meter.

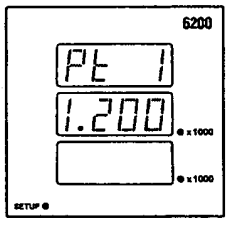
**NOTE**:You are required to enter a password at the beginning of an editing session. If your password is different from the default "0" you may want to refer to the previous section "Password Security."

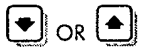
1.




**Enter Configuration Select mode**:
Press the Up and Down buttons together and hold for 2 seconds to enter Configuration Select mode from Display mode. The Setup LED remains lit in this mode.

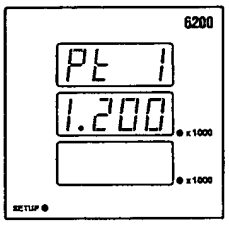
2.



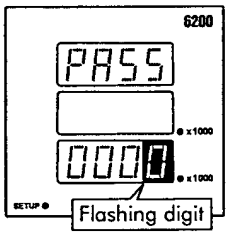

**Locate the parameter**:
Scroll through the parameter configuration screens with the Up or Down buttons until you locate the parameter you wish to edit (e.g. Pt1).

3.



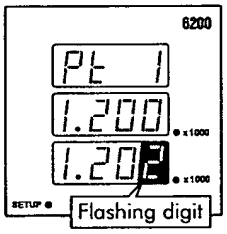

**Initiate the edit (Configuration Edit mode)**:
Press the Enter button to edit the displayed parameter (Pt1). If this is the first edit of a configuration session, the Password screen appears; otherwise proceed to step 5.

4.




**Confirm the password**
Press the Enter button to send the default password (0) to the meter (or enter and send your facility password). The Pt1 screen appears with the last digit flashing.

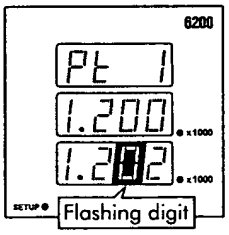
5.




(Press twice)

**Increment the digit by 2**:
Press the Up button twice to change the last digit from a zero to a two.

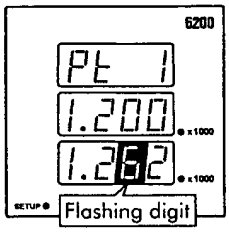
6.




...

**Move to the next digit**:
Press the Down button and hold for 2 seconds. The digit on the left flashes for editing.

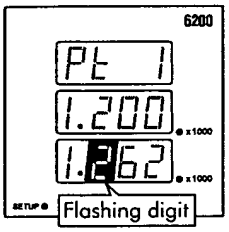
7.




(Press six times)

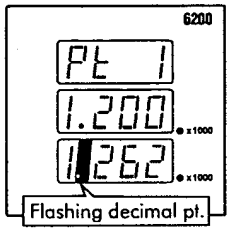
**Increment the digit by 6**:
Press the Up button six times to change the flashing digit from a zero to a six.

8.



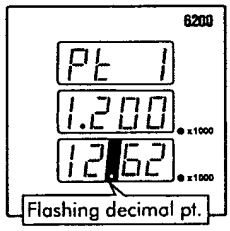

**Move to the next digit**:
Press the Down button and hold for 2 seconds. The digit on the left flashes for editing.

9.



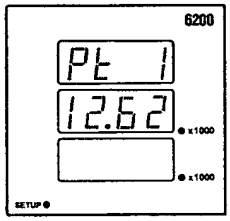

**Move to the decimal point**:
Press the Down button and hold for 2 seconds. The decimal point flashes for editing.

10.




**Re-locate the decimal point**:
Press the Up button to move the decimal point to the right. (The Down button moves it to the left).

11.




**Program the Pt1 value to the meter**:
Press the Enter button. The new Pt1 value displays on the second line; the third line is blank. This indicates that the new Pt1 value is programmed to the meter.

**NOTE**:If you attempt to configure a parameter with a number that is out of its range, the meter will not accept that number.

### Meter Settings

To learn about configurable meter settings, value ranges, and defaults, refer to "Meter Settings" on page 47.

### System Configuration with PowerView Software

With PowerView Lite software, you can access the networked meter from your workstation. There, you can view meter measurements or perform configurations without going to the meter site.

PowerView Lite is a free meter configuration and data viewing software application which operates under Windows 95/98/NT/2000 operating systems. PowerView Lite can be used with either PML or Modbus protocols, so you can modify setup parameters or view readings for a variety of devices (e.g. 6200 ION meter). Its simple interface allows for quick installation and reading verification for new meter installations. PowerView Lite is available from www.pml.com.

#### How to use PowerView Lite on your RS-485 network

1. Connect the meter to an RS-485 network (Modbus or PML). Note the Unit ID# for future use.
2. Start up PowerView Lite and create a new site.
3. Insert a Modbus device if the network is Modbus. Insert a 6200 ION meter if the network is PML protocol.
4. Type in the Unit ID#.
5. Select a table. If the network is Modbus, select the 6200 display table. If the network is PML, select the default table.

## Information Mode

Enter Information mode from Display mode (default) by pressing the Enter, the Up, and the Down buttons together and holding for 2 seconds. In this mode, you can verify that the front panel LEDs operate, and view meter information e.g. firmware version etc.

### Verifying that the LEDs and Display Function

When you enter Information mode, every LED on the front panel lights, and each line of the display flashes with four number eights and four decimal points per line. This lasts 3 seconds, and indicates that the front panel LEDs and display are operating.

### Information Mode Screens

The following table lists the four Information mode screens:

| Screen | String |
|---|---|
| Manufacturer ID Number | No string; area is used for the meter manufacturer/serial number. |
| Firmware Version | FWVr |
| Original Equipment Manufacturer (OEM) | OEM |
| Meter Options (e.g. enhanced measurements, digital outputs, communications) | OPt |

### Button Functions in Information Mode

The following table shows how the front panel buttons function in Information mode:

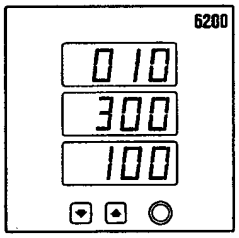
| Mode | Button | Function |
|---|---|---|
| **Information Mode**  ENTER Information mode by pressing the Enter, Up and Down buttons together and holding for 2 seconds. EXIT Information mode with the same button sequence. |  | Move to the previous Information mode screen. |
| |  | Move to the next Information mode screen. |

### Viewing Meter Information

After the LED and display operation verification is completed, the meter automatically displays the first of four screens that provide meter information. Press the Up or Down buttons to scroll through these screens.

**NOTE**:You have 60 seconds to move from one Information screen to another. After 60 seconds, the front panel defaults to Display mode.

## 1. Manufacturer ID

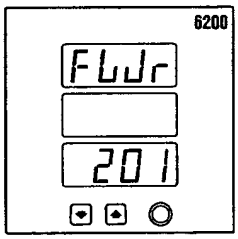



This screen displays the Manufacturer ID (serial) number.

Press the Down button to display meter firmware version or the Up button to display the previous screen.

OR

## 2. Firmware Version

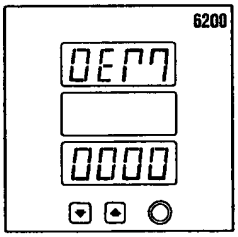



This screen displays the meter firmware version.

Press the Down button to display the OEM identifier, or the Up button to display the previous screen.

OR

## 3. OEM

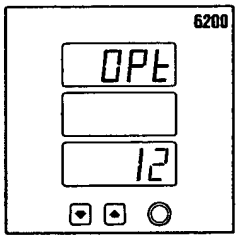



This screen displays the OEM identifier.

Press the Down button to display the Options Code or the Up button to display the previous screen.

OR

### 4. Options Code




This screen displays the Options Card options code.

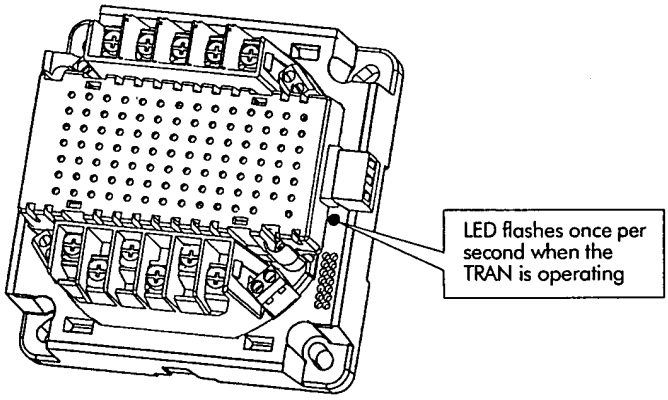
Press the Down button to display the Manufacturer ID or OR the Up button to display the previous screen.

Refer to the table "Options Card Combinations" on page 45 to learn about options codes, and how they relate to product codes.

## Verifying Meter Operation

To verify the Integrated model operation, ensure that the meter is receiving power, and that the display shows meaningful values.

To verify the TRAN model operation, ensure that the meter is receiving power, and that the LED located below the 3-position power supply connector flashes once per second. Refer to the diagram below.



# Appendix

The following specifications are subject to change without notice.

## Standards Compliance

| | |
|---|---|
| **UL** | Certified to UL 3111 Certified to CAN/USA C22.2 No. 1010-1 |
| **International** | IEC 61010-1 |
| | Measuring inputs comply with Installation Category III |
| | Power supply inputs comply with Installation Category II |
| | Device operable under Pollution Degree II |
| **Surge Withstand** | All inputs pass ANSI/IEEE C37.90-1989 surge withstand and fast transient tests |
| **FCC** | Part 15 of FCC Rules for a Class A Digital Device |
| **CE** | Marked |

| **Category** | **Standards Compliance** |
|---|---|
| Safety/ Construction | IEC1010-1 (EN61010-1): Safety requirements for electrical equipment for measurement, control and laboratory use |
| | CAN-CSA C22.2 No 1010-1: Canadian Standards. Listed by Underwriters Laboratories (UL). |
| | UL 3111-1: Measuring, Testing and Signal Generation Equipment. Listed by Underwriters Laboratories (UL). |
| IEC Compliance | IEC 60687-1992 0.5S*<br>* Only the Accuracy Measurement Specifications comply with this rating |
| Enclosure Mounting | Integrated model:<br>DIN (192 mm x 192 mm cutout)<br>ANSI 4" cutout |
| | TRAN model:<br>Flush mounted (has four slots in an ANSI 4" bolt pattern)<br>DIN rail, European Standard EN50022:1977 |

| Category | Standards Compliance |
|---|---|
| Electromagnetic Immunity | IEEE C.37-90.1-1989: IEEE Standard Surge Withstand Capability (SWC) Tests for Protective Relays and Relay Systems (ANSI) |
| | IEC1000-4-2 (EN61000-4-2/IEC801-2): Electrostatic Discharge (B) |
| | IEC1000-4-3 (EN61000-4-3/IEC801-3): Radiated EM Field Immunitiy (A) |
| | IEC1000-4-4 (EN61000-4-4/IEC801-4): Electric Fast Transient (B) |
| | IEC1000-4-5 (EN61000-4-5/IEC801-5): Surge Immunity (B) |
| | IEC1000-4-6 (EN61000-4-6/IEC801-6): Conducted Immunity |
| | IEC1000-3-2 (EN61000-3-2): Limits for harmonic currents emissions (equipment input current < 16 amps per phase) |
| | IEC1000-3-3 (EN61000-3-3): Limitation of voltage fluctuations and flicker in low voltage supply systems for equipment with rated current < 16 amps |
| | IEC 61000-6-2: Electromagnetic Compatibility, Immunity for industrial environments |
| Electromagnetic Emission | FCC Part 15 Subpart B, Class A: Class A Digital Device, Radiated Emissions. Certified by Acme Testing Inc. |
| | EN55011 (CISPR 11): Radiated/Conducted Emissions (Group 1, Class A) |
| | EN50081-2: Electromagnetic Compatibility, emissions |

c UL us

Certified to UL 3111
and CAN/CSA C22.2
No.1010-1

CE

## Quality Assurance

ISO 9002-1994
Registration Cert# 002188

ISO 9000 ISO 9002 certified by QMI

## Environmental

### Temperature

| | |
|---|---|
| Base Unit: | Operation: -20° C to 70° C ambient air (no ice formation) |
| | Storage: -40° C to +85° C |

### Humidity

| | |
|---|---|
| Base Unit and Display Unit: | 5% to 95% non-condensing |

### IP, NEMA Rating

When the integrated display unit or the RMD unit is mounted flush to a panel with the supplied gasket, then the front side meets **NEMA type 4, 4x and 5** (according to NEMA standards 1-10-1979 and 5-25-1988) and meets **IP 543.**

### Meter Enclosure

Impact resistant, high strength polycarbonate HBS blend plastic

## Input Ratings

### Voltage Inputs

| | |
|---|---|
| Inputs: | V1, V2, V3, Vref |
| Rated Input: | 400 LN/690 LL VAC rms (three phase) |
| | 400 (LN) VAC (single phase) |
| | Installation category III (Distribution). Pollution degree 2. |
| Overload: | 1500 VAC rms continuous |
| Dielectric Withstand: | > 3250 VAC rms, 60 Hz for 1 minute |
| Impedance: | 2 Mohm/phase |

### Current Inputs

| | |
|---|---|
| Inputs: | I1, I2, I3 |
| Rated Inputs: | 5 Arms (+ 20% maximum, 300 Vrms to ground)<br>Installation category III (Distribution). Pollution degree 2. |
| Overload: | 120 Arms for 1 second, non-recurring |
| Dielectric Withstand: | 3000 Vrms, for 1 minute |
| Starting Current: | 0.005 Arms |
| Burden: | 0.05 VA (typical) @ 5 Arms |

## Power Supply

### Standard AC Power Supply

| | |
|---|---|
| Rated Inputs: | AC: 100 – 240 VAC (± 10%), 50 – 60 Hz<br>DC: 110 – 300 VDC (± 10%)<br>Installation category II (Local). Pollution degree 2. |
| Dielectric Withstand: | 2000 VAC rms, 60 Hz for 1 minute |
| Burden: | 30 VA typical, 50 VA maximum, 15 W maximum |

### Low Voltage DC Power Supply Option

| | |
|---|---|
| Rated Inputs: | 20 – 60 VDC (± 10%) |
| Burden: | 6 W typical, 12 W maximum |

## I/O Specifications

### Digital Outputs

2 optically isolated digital outputs for KY pulsing
Maximum forward current: 100 mA
Maximum voltage: 200 VAC/DC

### RS-485 Input

Input is optically isolated

## Measurement Specifications

| Parameter | Accuracy ±(%rdg) | Range |
|---|---|---|
| Voltage (L-N) | 0.3% | 0 to $1x10^6$ V |
| Voltage (L-L) | 0.5% | 0 to $1x10^6$ V |
| Voltage (L-L Delta) | 0.8% | 0 to $1x10^6$ V |
| Frequency | 0.1% | 47 – 63 Hz |
| Current (I1, I2, I3) | 0.3% | 0 to $1x10^6$ A |
| Current (I4 Derivation) | 0.6% | 0 to $1x10^6$ A |
| kW, kVAR, kVA | IEC 687 Class 0.5* | 0 to $\pm 3.3x10^7$ |
| kWh, kVARh, kVAh | IEC 687 Class 0.5* | 0 to $\pm 3.3x10^7$ |
| kW, kVA demands | IEC 687 Class 0.5* | 0 to $\pm 3.3x10^7$ |
| Power Factor @ Utility PF | 1.0% | -0.01 to -100 and .0001 to 0.01 |
| THD | 1.0% | 0.1 to 100 |

* Complies with the accuracy requirements of IEC 687 class 0.5.

## Options Card Combinations

This table describes Options Card feature sets, and the information on the Options Code screen. Refer to "Viewing Meter Information" on page 39.

| Options Code | Part # Suffix | Description |
|---|---|---|
| 1 | Z0AN | Standard Measurements |
| 2 | Z0AP | Enhanced Package #1 |
| 3 | Z0AR | Enhanced Package #2 |
| 4 | Z0BN | Standard Measurements, two pulse outputs |
| 5 | Z0BP | Enhanced Package #1, two pulse outputs |
| 6 | Z0BR | Enhanced Package #2, two pulse outputs |
| 7 | A0AN | Standard Measurements, RS-485 |
| 8 | A0AP | Enhanced Package #1, RS-485 |
| 9 | A0AR | Enhanced Package #2, RS-485 |
| 10 | A0BN | Standard Measurements, two pulse outputs, RS-485 |
| 11 | A0BP | Enhanced Package #1, two pulse outputs, RS-485 |
| 12 | A0BR | Enhanced Package #2, two pulse outputs, RS-485 |

## Standard Measurements and Enhanced Packages 1 – 2

| Stnd | EP1 | EP2 | Parameter | Displays | Pulses | Comms |
|---|---|---|---|---|---|---|
| ● | ● | ● | Volts L-N Per Phase | ◒ | | ○ |
| ● | ● | ● | Volts L-L Per Phase | ● | | ● |
| ● | ● | ● | Volts L-N Avg | ● | | ● |
| ● | ● | ● | Volts L-L Avg | ● | | ● |
| ● | ● | ● | Amps Per Phase | ● | | ● |
| ● | ● | ● | Amps Avg | ● | | ● |
| | ● | ● | Power Peak Demand (W) | ● | | ● |
| | ● | ● | Energy Del. (Imported) (Wh) | ● | ● | ● |
| | ● | ● | Energy Rec. (Exported) (Wh) | | | ● |
| | ● | ● | Power Total (W) | ● | | ● |
| | ● | ● | Frequency | ● | | ● |
| | ● | ● | Power Factor Total | ● | | ● |
| | ● | ● | Amps Demand | ● | | ● |
| | ● | ● | Amps Peak Demand | ● | | ● |
| | ● | ● | Amps Neutral (I4) | ● | | ● |
| | | ● | Power Factor Per Phase | ● | | ● |
| | | ● | Power Per Phase (W) | ● | | ● |
| | | ● | Reactive Energy Del. (Imported) (VARh) | ● | ● | ● |
| | | ● | Reactive Energy Rec. (Exported) (VARh) | | | ● |
| | | ● | Apparent Energy (VAh) | ● | ● | ● |
| | | ● | Reactive Power Total (VAR) | ● | | ● |
| | | ○ | Apparent Power Total (VA) | ○ | | ○ |
| | | ● | Reactive Power Per Phase (VAR) | ● | | ● |
| | | ● | Apparent Power Per Phase (VA) | ● | | ● |
| | | ● | Power Demand (W) | ● | | ● |
| | | ● | Reactive Power Demand (VAR) | ● | | ● |
| | | ● | Apparent Power Demand (VA) | ● | | ● |
| | | ● | Reactive Power Peak Demand (VAR) | ● | | ● |
| | | ● | Apparent Power Peak Demand (VA) | ● | | ● |
| | | ● | THD Voltage Per Phase | ● | | ● |
| | | ● | THD Current Per Phase | ● | | ● |

## Meter Settings

These settings can be configured with the meter front panel or software.

| | String | Description | Range (Values) | Default |
|---|---|---|---|---|
| MODE | tYPE | Volts Mode | 4W (4-Wire WYE)<br>dELt (Delta)<br>2W (Single Phase)<br>dEM (Demonstration)<br>3W (3-Wire WYE)<br>dELd (Delta direct) | Delta direct |
| PTs | Pt 1 | PT1 (Primary) | 1 to (65.53 x 1000 LED) | 480 |
| | Pt2 | PT2 (Secondary) | 1 to (65.53 x 1000 LED) | 480 |
| CTs | Ct 1 | CT1 (Primary) | 1 to (65.53 x 1000 LED) | 400 |
| | Ct2 | CT2 (Secondary) | 1 to (65.53 x 1000 LED) | 5 |
| POLARITY | UPL 1 | V1 Polarity<br>(Phase 1 voltage polarity) | nor (Normal); inv (Inverted) | Normal |
| | UPL2 | V2 Polarity<br>(Phase 2 voltage polarity) | nor (Normal); inv (Inverted) | Normal |
| | UPL3 | V3 Polarity<br>(Phase 3 voltage polarity) | nor (Normal); inv (Inverted) | Normal |
| | CPL 1 | I1 Polarity<br>(Phase 1 current polarity) | nor (Normal); inv (Inverted) | Normal |
| | CPL2 | I2 Polarity<br>(Phase 2 current polarity) | nor (Normal; inv (Inverted) | Normal |
| | CPL3 | I3 Polarity<br>(Phase 3 current polarity) | nor (Normal); inv (Inverted) | Normal |
| DEMAND | dPr | Demand Sub Interval | 1 – 60 min | 15 |
| | ndPr | Number of Demand Periods | 1 – 5 | 1 |
| DIGITAL OUTPUTS | out 1 | Output Mode Digital #1 | *Wh, VAh, VARh See notes below.<br>**Ext 1, Ext 2 | Wh |
| | tc 1 | Time Constant 1 (kT)† | 0.1 – 999.9<br>(only 1 digit after the decimal pt. permitted) | 1.0 |
| | out2 | Output Mode Digital #2 | *Wh, VAh, VARh See notes below.<br>**Ext 1, Ext 2 | VARh |
| | tc2 | Time Constant 2 (kT)† | 0.1 – 999.9<br>(only 1 digit after the decimal pt. permitted) | 1.0 |
| | otI r | Output Mode, Irda | *Wh, VAh, VARh See notes below.<br>**Ext 1, Ext 2 | Ext 1 |
| | tcI r | Time Constant Irda (kT)† | 0.1 – 999.9<br>(only 1 digit after the decimal pt. permitted) | 1.0 |

| | String | Description | Range (Values) | Default |
|---|---|---|---|---|
| COMMUNICATIONS | bAUd | Baud Rate | 1200, 2400, 4800, 9600, 19200 | 9600 |
| | Prot | Protocol | PML†† ; Mod (ModbusRTU); FAct (Factory) | Modbus |
| | Un Id | Unit ID | 1 – 247 | 100 plus the last 2 digits of the Man. ID # |
| | rtS | RTS Delay | 0 – 1000 milliseconds | 20 |
| MODBUS SCALING | PUS | Voltage Scale | 0.001, 0.01, 0.1, 1, 10, 100, 1000 | 10 |
| | PCS | Current Scale | 0.001, 0.01, 0.1, 1, 10, 100, 1000 | 10 |
| | PPS | Power Scale | 0.001, 0.01, 0.1, 1, 10, 100, 1000 | 1 |
| | PnS | Neutral Scale | 0.001, 0.01, 0.1, 1, 10, 100, 1000 | 10 |
| DISPLAY | dSCr | Display Scroll Time | 0 – 30 seconds (0 = disable) | 0 (disabled) |
| | dUPd | Display Refresh Period | 1 – 6 seconds | 2 |
| SECURITY | PSEt | Password | 0 – 9999 | 0 |

## Notes

### Digital Outputs

* The units displayed on the front panel are Wh, VAh, and VARh with the "x 1000" LED lit. Note that these indicate kWh, kVAh, and kVARh respectively.

** In Ext 1 or Ext 2 mode, the digital pulse outputs are reserved for Feature Packs.

† Time Constant, sometimes called kT, is the number of units (kWh, kVAh, kVARh) per output transition. The digital output uses KY pulsing. This means that the relay changes from open to closed or from closed to open whenever kT units have been measured (20 transitions per second maximum).

### PML Protocol

†† ION compatible PML protocol for use with the PEGASYS system and other ION meters.

*For further information or technical assistance, please contact your local Power Measurement representative, or Customer Service at one of the following locations:*


**World Wide Web**
www.pml.com

**E-Mail** support@pml.com

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**Europe**
POWER MEASUREMENT EUROPE
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POWER MEASUREMENT AUSTRALIA
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